MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole Log Data Report

**Log Event** A

**Borehole** 10-03-11

## Borehole Information

| | | |
|---|---|---|
| **Farm :** A | **Tank :** A-103 | **Site Number :** 299-E25-84 |
| **N-Coord :** 41,250 | **W-Coord :** 47,635 | **TOC Elevation :** 687.53 |
| **Water Level, ft :** | **Date Drilled :** 4/30/1964 | |

### Casing Record

| | | |
|---|---|---|
| Type : Steel-welded | Thickness : 0.280 | ID, in. : 6 |
| Top Depth, ft. : 0 | Bottom Depth, ft. : 85 | |

**Borehole Notes:**

Borehole 10-03-11 was originally drilled in February 1962 to a depth of 75 ft. In April 1964, the borehole was deepened to 85 ft. The borehole casing diameter measured in the field was 6 in., while Chamness and Merz list this as an 8-in. borehole. Unfortunately, neither the driller's log from 1962 nor the log from 1964 identify the diameter of the casing. Based on the driller's log, the borehole was extended by driving the existing casing. Neither the driller's log nor Chamness and Merz indicate that the casing was grouted or perforated.

It is assumed that the casing diameter is 8 in., based on the information presented in Chamness and Merz. A string of casing was almost certainly added to the existing borehole at the time the berm was constructed, and it would have been the diameter of this casing that was measured at the time of borehole logging as 6 in. The 8-in. casing thickness is presumed to be 0.31 in., on the basis of the published thickness for schedule-40, 8-in. steel tubing.

The top of the casing, which is the zero reference for the SGLS, is approximately 6 in. above the top of a berm that rises approximately 3 ft above the surrounding ground surface.

## Equipment Information

| | | |
|---|---|---|
| **Logging System :** 2 | **Detector Type :** HPGe | **Detector Efficiency:** 35.0 % |
| **Calibration Date :** 05/1995 | **Calibration Reference :** GJPO-HAN-5 | **Logging Procedure :** P-GJPO-1783 |

## Logging Information

| | | |
|---|---|---|
| **Log Run Number :** 1 | **Log Run Date :** 09/27/1996 | **Logging Engineer:** Bob Spatz |
| **Start Depth, ft.:** 0.5 | **Counting Time, sec.:** 100 | **L/R :** L **Shield :** N |
| **Finish Depth, ft. :** 14.5 | **MSA Interval, ft. :** 0.5 | **Log Speed, ft/min.:** n/a |

| | | |
|---|---|---|
| **Log Run Number :** 2 | **Log Run Date :** 09/30/1996 | **Logging Engineer:** Bob Spatz |
| **Start Depth, ft.:** 87.5 | **Counting Time, sec.:** 100 | **L/R :** L **Shield :** N |
| **Finish Depth, ft. :** 14.5 | **MSA Interval, ft. :** 0.5 | **Log Speed, ft/min.:** n/a |

**Borehole** 10-03-11

**Log Event** A

**Logging Operation Notes:**

This borehole was logged in two log runs. The total logging depth achieved by the SGLS was 87.5 ft.

## Analysis Information

Analyst : D.L. Parker

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 03/19/1998

**Analysis Notes :**

The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from these spectra were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

A casing correction factor for 0.310-in.-thick casing was applied to the log data during the analysis process.

Shape factor analysis was applied to the SGLS data and provided insights into the distribution of Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

**Log Plot Notes:**

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A plot of the shape factor analysis results is included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

**Results/Interpretations:**

The man-made radionuclides Cs-137, Co-60, and Eu-154 were detected around this borehole. Cs-137 contamination was detected nearly continuously from the ground surface to 18 ft, intermittently from 19 to 53.5 ft, and almost continuously from 55.5 ft to the bottom of the logged interval (87.5 ft). Co-60 contamination was measured nearly continuously from 3.5 to 5 ft. Eu-154 contamination was measured continuously from 3.5 to 6.5 ft.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides. Interpretation of the

**Borehole** 10-03-11

**Log Event** A

shape factor results are presented in the individual tank summary data reports.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank A-103.